AURAL REHABILITATION SYSTEM AND A METHOD OF USING THE SAME

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application claims the benefit of U.S. provisional application Nos. 60/578,944 and 60/579,039, both filed 12 Jun. 2004, U.S. provisional application No. 60/619,374, filed 14 Oct. 2004, and U.S. provisional application No. 60/666,864, filed 19 Apr. 2005, all of which are incorporated by reference in their entireties herein.

BACKGROUND OF THE INVENTION

[0002] 1. Field of the Invention

[0003] The present invention relates generally to a system for neurological (e.g., aural) rehabilitation and/or treatment and/or therapy, such as for listening and comprehension, and a method of using the same.

[0004] 2. Description of the Related Art

[0005] Increased age and hearing deficiencies can impair cognitive function, contextual skills, temporal processing and interactive communication skills. For example, individuals with sensorineural hearing loss (comprising over 90% of hearing aid users) have greater difficulty processing speech in noise than their normal hearing counterparts. Part of the reason for this difficulty relates to the reduction in tuning (i.e., broadened filters) in the peripheral auditory mechanism (i.e., the cochlea). However, another major cause for difficulty relates to the central auditory mechanism (i.e., brain). It has been shown experimentally that auditory deprivation as well as the introduction of novel stimuli lead to altered cortical representation (i.e., auditory plasticity). It is not clear whether this altered neuronal function will result in improved or diminished ability to understand speech in adverse conditions once audibility is fully or partially restored with wearable amplification.

[0006] Furthermore, the average hearing-impaired adult delays getting professional services for approximately seven years after first recognizing that a hearing impairment is present. This period of time is more than sufficient to develop compensatory listening habits that, again, may be beneficial or may be detrimental. Regardless, once a person begins wearing hearing aids, the brain must again adapt to a new set of acoustic cues. Currently, there is little treatment beyond the fitting of the hearing aid to the hearing loss. One would not expect an amputee to be furnished with a new prosthetic device without some type of physical therapy intervention, yet this is precisely what is done for people receiving new hearing devices.

[0007] An exemplary speed of processing test, the Stroop test, consists of three parts: reading of color words, color naming, and an interference task. Stroop test subjects note the strong interference of word reading with color naming, called the Stroop interference effect (e.g. the word "red" printed in green requires the verbal response "green"). Additionally, a nomination score is quantified in terms of the difference in reaction times of reading of color words and color naming. The tendency to interference (selection) is quantified in terms of the difference in reaction times of color naming and the interference task. An activation of the frontal lobes occurs during the Stroop test in healthy subjects. The Stroop test has been used for diagnostic purposes, but not for aural rehabilitation purposes.

[0008] There exists a need for a neurological, for example aural, rehabilitation system and a method of using the same.

BRIEF SUMMARY OF THE INVENTION

[0009] A neurological rehabilitation or training system is disclosed. Any time rehabilitation is mentioned herein, it may be replaced by training, as the subject can have a hearing or neurological loss or not. The neurological system can have audio architecture for use in audiological rehabilitation or training. The audio architecture can be configured to perform one or more audio engine tasks. The audio engine tasks can be dynamic mixing of sound and noise, delaying a signal such as during mixing two signals or a signal and noise, time compressing a signal, distorting a signal, equalizing a signal.

[0010] A method of using a neurological rehabilitation or training system is disclosed. The method includes altering one or more signals for the use in audiological treatment and/or training.

BRIEF DESCRIPTION OF THE DRAWINGS

[0011] **FIG. 1A** illustrates mean results from objective QuickSIN™ testing at 45 dB on control (square) and training (circle) groups before and after use of the methods disclosed herein.

[0012] **FIGS. 1B** illustrates mean results from objective QuickSIN™ testing at 70 dB on control (square) and training (circle) groups before and after use of the methods disclosed herein.

[0013] **FIG. 1C** illustrates mean results from objective HINTS testing on control (square) and training (circle) groups before and after use of the methods disclosed herein.

[0014] **FIGS. 2A through 2C** illustrate test results from subjective measures on control and trained groups before and after use of the methods disclosed herein.

[0015] **FIGS. 3A through 3E** illustrate responses of the training group from a survey at the end of training.

[0016] **FIG. 4A through 4E** illustrate average improvement scores for the training group on the modules.

[0017] **FIG. 5** illustrates an embodiment of an audiological treatment system.

[0018] **FIG. 6** illustrates an embodiment of a local device.

[0019] **FIG. 7** is a perspective view of an embodiment of a single earpiece.

[0020] **FIG. 8** illustrates section A-A of the earpiece of **FIG. 7**.

[0021] **FIG. 9** illustrates an embodiment of a method of audiological treatment.

[0022] **FIG. 10** illustrates an embodiment of a method of initial audiological diagnosis.

[0023] **FIG. 11** illustrates an embodiment of a method of determining if the patient is a suitable candidate for treatment.